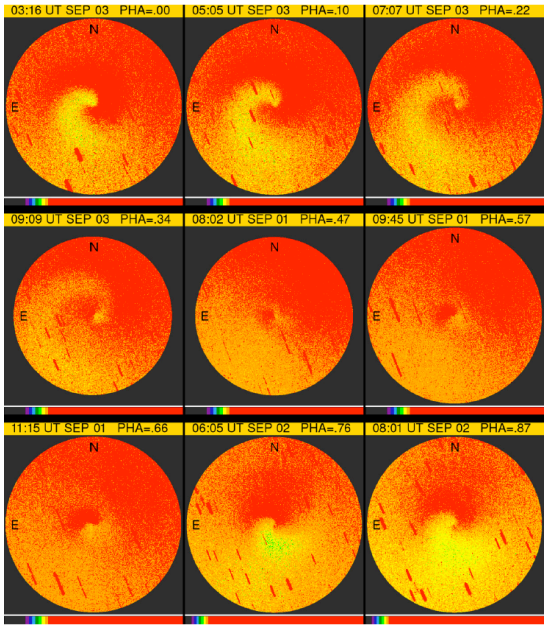
Request for Coma Images Showing Morphology of Comet ISON Observed at Different Locations Around the World

1. What can we learn from temporally well-sampled images showing coma morphology?

The science we can extract includes the rotational state of the nucleus, characterization of the nucleus' activity, gas and dust properties in the coma (e.g., outflow velocities), chemical origin of gas species in the coma, and temporal behavior of the tail structure when the comet is close to the sun.



As an example, a series of *enhanced* images (i.e., processed images that highlight low-contrast coma features) of comet 103P/Hartley 2 corresponding to CN gas, sorted based on the rotational phase (listed at the top of each panel) is shown on the left. The period corresponding to the dominant component of the non-principal axis rotation for this comet at many different times was determined based on the repeatability in the morphology and it was clear that a temporally well-sampled set of images was *crucial* for the determination of the period. The red color denotes the brighter features and the temporal evolution of the morphology as a function of the rotational phase is apparent. This figure is from Samarasinha et al. 2011, ApJL, 734, L3 and is reproduced by permission of the AAS.

2. Why do we need an international campaign of coma images?

For most of the time when the comet is close to the Earth and easily studied, we expect ISON will be highly active and likely to have a coma with embedded structures. However, it will be above the horizon at moderate airmass for only a few hours per night for most locations/observatories. An international campaign observing the comet from around the globe, would allow better temporal coverage, allowing 24/7 observations of the comet across all longitudes.

3. What kind of images do we need?

Continuum (dust) images as well as gas (e.g., CN) images with good signal-to-noise (but with an unsaturated nucleus) are desired when the comet will be highly active (< 2AU from the Sun). Generally, images need to be enhanced to identify the coma structure and we will carry out that task. The best times to obtain images from Earth based telescopes will be approximately from mid-October to early-November 2013 (during pre-perihelion) and mid-December 2013 to mid-January 2014 (during post-perihelion). Any number of images from a given site on any given night will help this project (i.e., there is no set minimum number of images but at least two images from a given site on a given night are desirable).

There is no need for absolute flux-calibrated images. Only basic image reductions (e.g., bias subtraction, flat fielding) need to be performed by the observer. Therefore, many observers (both professionals and amateurs) can easily make valuable contributions. Images should preferably be in the FITS format. Ideally, the comet should be guided non-sidereally and at the comet's rate of motion. When, non-sidereal guiding is unfeasible, co-adding a number of un-trailed short exposures of the comet taken close in time could yield a good signal-to-noise image.

4. Have there been any successful global comet campaigns?

There are many past global collaborations. Coordinated global campaigns yielded important science and/or mission support for space missions (e.g., International Halley Watch, Deep Impact, and EPOXI observing campaigns provided detailed measurements for comets 1P/Halley, 9P/Tempel 1, and 103P/Hartley 2 respectively).

Hartley 2 continuum images from around the world provide an example where one could determine the behavior of morphological evolution as a function of time which is otherwise not possible (or difficult) to obtain from a single observatory (Samarasinha et al. 2012; DPS meeting abstract and publication in preparation).

As an example, the geographical distribution of observatories contributing to the EPOXI global observing campaign led by Karen Meech is shown on the left. The observations from this global campaign provided excellent temporal coverage for comet 103P/Hartley 2. This figure is from Meech et al., 2011, ApJL, 734, L1 and is reproduced by permission of the AAS.

5. What do you gain?

Science that could not be derived from observations taken at a single observatory/location will be made feasible.

Observations with sufficient signal-to-noise that could be used in any publication resulting from this study will be acknowledged with co-authorship for the observers.

For additional questions (including how to send images), please contact:

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